Claims

1. Method for transmitting watermark data bits (IWATD) using a spread spectrum, said method including the steps:
- modulating (BVMOD) said watermark data bits on an encoder pseudo-noise sequence (ENCPNSEQ);
- Transforming (WATSE) said modulated encoder pseudo-noise sequence (WATS) into the frequency domain and shaping it in amplitude according to the masking level curve of an audio signal together with which the watermark data bit information is to be transmitted or transferred, and transforming (WATSE) said shaped encoder pseudo-noise frequency domain sequence back into the time domain;
- Combining (WATSE) said inverse transformed encoder pseudo-noise frequency domain sequence with a current frame of data of said audio signal;
- Transmitting or transferring (TRM) said combined audio signal frame or frames carrying said watermark data bits, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) is one Nth of the length of a frame of said audio signal, N being an integer number greater one, wherein N orthogonal encoder pseudo-noise sequences (ENCPNSEQ) are used per frame of said audio signal for carrying out said combining for corresponding sections of a current frame.

2. Method for regaining watermark data bits (IWATD) embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated (BVMOD) at encoder side on an encoder pseudo-noise sequence (ENCPNSEQ) and said modulated encoder pseudo-noise sequence (WATS) was transformed (WATSE) into the frequency domain and shaped in amplitude according to the masking level curve (PSYMC) of an audio signal together with which the watermark data bit information was transmitted or transferred (TRM), and said shaped encoder pseudo-noise frequency domain se-

quence was transformed (WATSE) back into the time domain and was combined with a current frame of data of said audio signal, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) was one Nth of the length of a frame of said audio signal, N being an integer number greater one, wherein N orthogonal encoder pseudo-noise sequences (ENCPNSEQ) were used per frame of said audio signal for carrying out said combining for corresponding sections of a current frame,

said method including the steps:

- Receiving (REC, SYNC) and synchronising said transmitted or transferred audio signal;
- Convolving (DRECMF) each one of a corresponding section of said current frame of data of said audio signal with the corresponding one of time-inversed versions (DECPNSEQ) of the N orthogonal encoder pseudo-noise sequences;
- Determining (DRECMF), for each one of said sections, from the sign of the peak or peaks of the corresponding convolution result the value of a bit of said watermark data (OWATD).

3. Method for regaining watermark data bits (IWATD) embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated (BVMOD) at encoder side on an encoder pseudo-noise sequence (ENCPNSEQ) and said modulated encoder pseudo-noise sequence (WATS) was transformed (WATSE) into the frequency domain and shaped in amplitude according to the masking level curve (PSYMC) of an audio signal together with which the watermark data bit information was transmitted or transferred (TRM), and said shaped encoder pseudo-noise frequency domain sequence was transformed (WATSE) back into the time domain and was combined with a current frame of data of said audio signal, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) corresponded to the length of a

frame of said audio signal and said encoder pseudo-noise sequence (ENCPNSEQ) was used for carrying out said combining for a current frame,
said method including the steps:

- Receiving (REC, SYNC) and synchronising said transmitted or transferred audio signal;
- Determining (EDET) in the received audio signal one or more echoes and the related echo delays;
- Constructing a modified decoder pseudo-noise sequence (MDECPNSEQ) based on the time-inversed version of said encoder pseudo-noise sequence (ENCPNSEQ) whereby, according to the echo delay or delays determined, correspondingly time-shifted versions of said time-inversed encoder pseudo-noise sequence are combined in order to construct said modified decoder pseudo-noise sequence;
- Convolving (DRECMF) said current frame of data of said audio signal with said modified decoder pseudo-noise sequence (MDECPNSEQ);
- Determining (DRECMF) from the sign of the peak or peaks of the convolution result the value of a bit of said watermark data (OWATD).

4. Method according to claim 3, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) is one Nth of the length of a frame of said audio signal, N being an integer number greater one, wherein N orthogonal encoder pseudo-noise sequences (ENCPNSEQ) were used per frame of said audio signal for carrying out said combining for corresponding sections of a current frame,
and wherein, for said constructing step, the N time-inversed versions of said orthogonal encoder pseudo-noise sequences (ENCPNSEQ) for a current frame are assembled together before applying said combining,
and wherein each one of a corresponding section of said current frame of data of said audio signal is convolved (DRECMF) with the corresponding section of said modified

decoder pseudo-noise sequence (MDECPNSEQ),

- and wherein, for each one of said sections, from the sign of the peak or peaks of the corresponding convolution result the value of a bit of said watermark data (OWATD) is determined (DRECMF).

5. Method according to claim 3 or 4 wherein, when determining (EDET) in the received audio signal one or more echoes and the related echo delays, the results for several audio frames are evaluated before a final result on the echo delay is formed.

6. Apparatus for transmitting watermark data bits (IWATD) using a spread spectrum, said apparatus including:

- Means (BVMOD) for modulating said watermark data bits on an encoder pseudo-noise sequence (ENCPNSEQ);
- Means (WATSE) for transforming said modulated encoder pseudo-noise sequence (WATS) into the frequency domain and for shaping it in amplitude according to the masking level curve of an audio signal together with which the watermark data bit information is to be transmitted or transferred, and for transforming said shaped encoder pseudo-noise frequency domain sequence back into the time domain;
- Means (WATSE) for combining said inverse transformed encoder pseudo-noise frequency domain sequence with a current frame of data of said audio signal;
- Means (TRM) for transmitting or transferring said combined audio signal frame or frames carrying said watermark data bits,

wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) is one Nth of the length of a frame of said audio signal, N being an integer number greater one,
wherein N orthogonal encoder pseudo-noise sequences (ENCPNSEQ) are used per frame of said audio signal for carrying out said combining for corresponding sections of

a current frame.

7. Apparatus for regaining watermark data bits (IWATD) embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated (BVMOD) at encoder side on an encoder pseudo-noise sequence (ENCPNSEQ) and said modulated encoder pseudo-noise sequence (WATS) was transformed (WATSE) into the frequency domain and shaped in amplitude according to the masking level curve (PSYMC) of an audio signal together with which the watermark data bit information was transmitted or transferred (TRM), and said shaped encoder pseudo-noise frequency domain sequence was transformed (WATSE) back into the time domain and was combined with a current frame of data of said audio signal, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) was one Nth of the length of a frame of said audio signal, N being an integer number greater one, wherein N orthogonal encoder pseudo-noise sequences (ENCPNSEQ) were used per frame of said audio signal for carrying out said combining for corresponding sections of a current frame,
said apparatus including:

- Means (REC, SYNC) for receiving and synchronising said transmitted or transferred audio signal;
- Means (DRECMF) for convolving each one of a corresponding section of said current frame of data of said audio signal with the corresponding one of time-inversed versions (DECPNSEQ) of the N orthogonal encoder pseudo-noise sequences, and for determining, for each one of said sections, from the sign of the peak or peaks of the corresponding convolution result the value of a bit of said watermark data (OWATD).

8. Apparatus for regaining watermark data bits (IWATD) embedded in a spread spectrum, whereby the corresponding original watermark data bits were modulated (BVMOD) at

encoder side on an encoder pseudo-noise sequence (ENCPNSEQ) and said modulated encoder pseudo-noise sequence (WATS) was transformed (WATSE) into the frequency domain and shaped in amplitude according to the masking level curve (PSYMC) of an audio signal together with which the watermark data bit information was transmitted or transferred (TRM), and said shaped encoder pseudo-noise frequency domain sequence was transformed (WATSE) back into the time domain and was combined with a current frame of data of said audio signal, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) corresponded to the length of a frame of said audio signal and said encoder pseudo-noise sequence (ENCPNSEQ) was used for carrying out said combining for a current frame, said apparatus including:

- Means (REC, SYNC) for receiving and synchronising said transmitted or transferred audio signal;
- Means (EDET) for determining in the received audio signal one or more echoes and the related echo delays, and for constructing a modified decoder pseudo-noise sequence (MDECPNSEQ) based on the time-inversed version of said encoder pseudo-noise sequence (ENCPNSEQ) whereby, according to the echo delay or delays determined, correspondingly time-shifted versions of said time-inversed encoder pseudo-noise sequence are combined in order to construct said modified decoder pseudo-noise sequence;
- Means (DRECMF) for convolving said current frame of data of said audio signal with said modified decoder pseudo-noise sequence (MDECPNSEQ), and for determining from the sign of the peak or peaks of the convolution result the value of a bit of said watermark data (OWATD).

9. Apparatus according to claim 8, wherein the length of said encoder pseudo-noise sequence (ENCPNSEQ) is one Nth of the length of a frame of said audio signal, N being an integer number greater one, wherein N orthogonal encoder

pseudo-noise sequences (ENCPNSEQ) were used per frame of said audio signal for carrying out said combining for corresponding sections of a current frame,
and wherein, in said determining means, the N time-inversed versions of said orthogonal encoder pseudo-noise sequences (ENCPNSEQ) for a current frame are assembled together before applying said combining,
and wherein each one of a corresponding section of said current frame of data of said audio signal is convolved in said convolving and determining means (DRECMF) with the corresponding section of said modified decoder pseudo-noise sequence (MDECPNSEQ),

- and wherein, for each one of said sections, from the sign of the peak or peaks of the corresponding convolution result the value of a bit of said watermark data (OWATD) is determined in said convolving and determining means (DRECMF).

10 Apparatus according to claim 8 or 9 wherein, in said determining means (EDET), in the received audio signal one or more echoes and the related echo delays, the results for several audio frames are evaluated before a final result on the echo delay is formed.